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Effects of *Aphthona* flea beetles and sheep grazing in leafy spurge stands

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Summary

The objectives of this experiment include: 1) documenting individual effects of *Aphthona* spp. populations in leafy spurge stands; 2) documenting effects of both agents acting together in leafy spurge stands; and 3) determining if sheep grazing has a detrimental impact on establishment of *Aphthona* spp. populations. Two Montana sites have been utilized: the "Raynesford" site in Judith Basin Co., and the "Story Hills" site in Gallatin Co. At both sites, a randomized complete block design has been employed, using square plots ("blocks") roughly 15.3 m (50 feet) on a side. Twelve plots were established at each site, representing three replications of four experimental treatments. The four treatments are: 1) *Aphthona* spp. flea beetles alone; 2) sheep grazing alone; 3) *Aphthona* flea beetles and sheep grazing; and 4) no beetles or grazing (control). All plots experiencing grazing were fenced to confine sheep.

Adult beetles were released in the center of each ungrazed or grazed *Aphthona* plot; Raynesford plots received 500 *Aphthona nigriscutis* in July 1990, while Story Hills plots received 1,000 *Aphthona flava* in July 1991. Grazed plots received two grazing episodes per year, beginning in 1991. These plots were first grazed in the spring, up to approximately the second week in June, and grazed again in late August to early September. The number of sheep used per plot varied by site and year, but grazing was allowed to proceed until all palatable vegetation had been cropped.

Forty permanent 0.1-m^2 subplots were established along three parallel transects in each plot. Data collected within each subplot included leafy spurge density and stem height, and "canopy cover" attributable to spurge, grasses, forbs, plant litter, and bare ground. Five "biomass" samples were randomly-collected from each plot; all aboveground vegetation within a 0.1-m^2 area was removed, separated into spurge, grass, and forb components, oven-dried, and weighed. In 1991, sweep-net samples were conducted to note presence or absence of released flea beetles. In 1992, five net sweeps were made at 1, 3, 5, and 7 m from the initial release point along each cardinal direction (80 sweeps per plot), and all beetles collected were counted.

1993 data are not yet available, but two years of sheep grazing have had no apparent effect on the establishment and subsequent size of *Aphthona nigriscutis* and *Aphthona flava* populations, given the grazing schedule employed in this study.

Through 1992, sheep grazing has reduced leafy spurge and grass aboveground biomass. By 1993, grazing has reduced spurge density at Raynesford but not at Story Hills; grazing has reduced spurge stem height at both sites. Sheep grazing has caused reductions in spurge "cover" (Raynesford only), grass cover, and forb cover while increasing "cover" attributable to plant litter or bare ground. These results are not unexpected, since data were collected in leafy spurge stands following an early-season grazing episode, and thus represent measurements of "regrowth" spurge. Reduced grass and forb cover and grass biomass simply confirm that sheep ate these plants as well as leafy spurge.

Within two years after initial release (1992), *Aphthona* flea populations have had no significant impact on aboveground vegetative biomass. Through 1993, *A. nigriscutis* (Raynesford) has significantly reduced leafy spurge density, "canopy" cover, and stem heights; reductions in leafy spurge may be accompanied by increases in grasses and non-spurge forbs. At Story Hills, *A. flava* populations have had no consistent impact on various vegetation indices.

By 1993, sheep grazing and *A. nigriscutis* populations (Raynesford) appear to have reduced leafy spurge stem densities more than either agent acting alone.